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(54) **Process for laser treating the surface of a coated substrate**

Verfahren zur Bearbeitung der Oberfläche eines beschichteten Substrats

Procédé pour traiter la surface d'un substrat plaqué

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Description

[0001] The present invention relates to a process for reducing the thickness of a polymeric photoconductive coating on a photoreceptor.

[0002] In the manufacture of coated substrates such as layered photoreceptors, it is often desirable to uniformly reduce the thickness of a coating in a predetermined region. For example, in producing coated photoreceptors, it is frequently necessary to reduce the thickness of the photoreceptor's seams, taper or seal edges of the photoreceptor, or remove excess material in the "sag" area of a dip-coated photoreceptor drum. Sag areas are regions of thicker coating formed when wet coating material migrates down the side of a dip-coated drum as the drum is lifted out of a coating bath.

[0003] Conventionally, coated substrate surfaces are treated to remove excess coating material by applying chemical solvents or by mechanically machining the substrate surface. However, chemical or mechanical treatments often do not provide the treated substrate with a sufficiently uniform and smoothly polished surface suitable for certain commercial uses such as the manufacture of photoreceptors. Chemical treatments can cause solvent droplets or vapor to contact the coating in regions that are not intended to be removed, reducing the quality of the photoreceptor. Furthermore, organic solvents have a limited useful life and are hazardous to work with. Mechanical machining techniques for removing coatings are cumbersome, inefficient, and often produce photoreceptors of unacceptable quality. Moreover, chemical or mechanical treatments do not achieve precise tolerances, which renders such processes unsuitable for reducing the thickness of a coating such as a polymer coating on a predetermined surface region of the substrate.

[0004] A laser treatment method for trimming thick film hybrids is known from Electronic Packaging & Production, Vol. 30, No. 11, November 1990, Newton, Mass., U.S., pages 58-61, XP000165899, Markstein, H. W., "Lasers Fine Tune Thick Film Hybrids."

[0005] IEEE Circuits and Devices, Vol. 6, No. 5, September 1990, New York, U.S., pages 19-24, XP000205542, Brannon, J.H., et al., discloses excimer laser ablation and etching of a substrate surface for semiconductor process technology. All of the processes explained therein and performed by excimer laser technology provide for a complete removal of the material at the desired spot in the direction of its thickness.

[0006] JP-A-3-144,458 discloses an attempt to eliminate mechanical and chemical treatments of coated photoreceptors. A laser beam from an yttrium-aluminum-garnet laser is irradiated at the end portions of a photoreceptor drum to burn or sublimate the photoreceptor coating. JP-A-3-194,131 discloses a similar process in which laser energy is directed at the ends of a photoreceptor in an effort to completely remove the coating.

[0007] Although these laser treatment processes are intended to completely remove a photoreceptor coating, it has been found that many materials commonly used in photoreceptor coatings are melted, rather than vaporized, by these processes. The molten coating subsequently hardens and must be removed by chemical or mechanical means. Moreover, in some instances it is desirable to uniformly remove only part of the coating, rather than completely vaporize and/or melt the entire coating.

[0008] Thus it is the object of the present invention to provide a process according to the preamble of claim 1 which meet the above requirements.

[0009] This object is solved accoring to the invention with a process having the features set out in claim 1.

[0010] The process of the invention uniformly reduces the thickness of a polymeric photoconductive coating on a photoreceptor and can produce a smooth and highly uniform surface while achieving precise tolerances of a few microns.

[0011] The laser machining process of the invention eliminates the need to chemically or mechanically treat the coated substrate surfaces. If desired, the laser machining process can be carried out in conjunction with conventional chemical treatments or mechanical polishing processes. The process can be used to remove non-uniform areas from coated photoreceptors.

[0012] Preferred embodiments of the invention will be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 shows a coated photoreceptor being laser machined according to a process of the present invention;

FIG. 2 illustrates a profilometer trace of a portion of the surface of a coated photoreceptor that has been laser machined according to a process of the invention;

FIG. 3 is a top view of a cylindrical photoreceptor having a non-uniform coating just before being laser machined according to a process of the invention;

FIG. 4 shows the cylindrical photoreceptor of FIG. 3 as the non-uniform coating is laser machined according to a process of the invention;

FIG. 5 shows a preferred orientation of the laser beam for carrying out a process of the invention;

FIG. 6 shows a seamed belt being laser machined according to a process of the invention;

FIG. 7 is an enlarged partial side view of FIG. 5, showing the portion of the seam to be removed by the laser beam.

[0013] Preferably, the coated photoreceptor is a belt-type photoreceptor or a dip-coated photoreceptor drum. For purposes of illustration, the laser machining process of the invention will be described with respect to the treatment of a coated cylindrical photoreceptor.

[0014] Referring to FIG. 1, a partially processed pho-

toreceptor drum 2 is shown. Drum 2 includes a rigid cylindrical substrate 4 having an outer coating 6 formed over the substrate. Substrate 4 can be made of any suitable material such as aluminum, nickel, zinc, chromium, conductive paper, stainless steel, cadmium, titanium, metal oxides, polyesters such as MYLAR®, and the like. Substrate 4 can be formed as one layer or as a plurality of layers, for example as a conductive layer coated over an insulating layer. The thickness of substrate 4 can vary widely depending on the intended use of the photoreceptor, and preferably is from about 65 μm to about 5 mm thick, preferably from about 0.1 mm to about 1.5 mm.

[0015] Coating 6 can include one or a plurality of layers, and typically in a photoreceptor will include multiple layers such as an electrically conductive ground plane, a blocking layer, an adhesive layer, a charge generating (photogenerating) layer, a charge transporting layer and an overcoat layer. The laser machining process removes part of at least one coating layer at the predetermined surface portion of the photoreceptor. Any desired depth of laser machining, extending through a preselected number of coating layers, can be achieved to precise tolerances using the process of the invention. In addition, the process successfully removes other materials that are contained within the treated coating, such as pigments, adhesives, solvents, binders, and conductive particles of metal oxides and carbon black.

[0016] The layers of coating 6 are formed using well-known techniques and materials. For example, coating 6 can be applied to substrate 4 by vacuum deposition, immersion, spray coating, or dip coating. Dip coating or spray coating are preferred. Suitable coating techniques and materials are illustrated in US-A-5,091,278, 5,167,987 and 5,120,628. The laser machining process can be carried out in conjunction with the coating process, after the coating has partially hardened. Preferably, laser machining is performed after the coating has substantially or fully hardened.

[0017] Coating 6 preferably includes, as a photoconductive material, one or a plurality of layers of selenium, metal alloys, and/or organic resins carrying photoconductive materials. Organic photoconductor coatings are preferred. Such coatings include a photoconductive material such as pigments including dibromoanthanthrone, metal-free and metal phthalocyanines, halogenated metal phthalocyanines, perylenes, and azo pigments, carried in a suitable organic binder resin. Examples of useful organic binder resins include polycarbonates, acrylate polymers, vinyl polymers, cellulose polymers, polysiloxanes, polyamides, polyurethanes, polyesters, and block, random or alternating copolymers thereof.

[0018] Drum 2 is preferably mounted such that its axis 8 is vertically oriented. Drum 2 is preferably mounted using a conventional chucking device coupled to a drive (not shown), so that drum 2 can be rotatably driven about axis 8 in the direction of arrow A. Preferably, coated drum 2 is rotated while the laser energy is directed at a predetermined surface portion of coating 6. Drum 2 is preferably oriented such that its axis 8 is approximately perpendicular to the direction of the laser beam impinged upon the surface of the substrate. In this fashion, a circumferential strip 14 of coating 6 is repeatedly exposed to the action of the laser beam. The rotational speed can be selected depending, for example, on the type of coating treated, the power and focal length of the laser, the angle of incidence of the laser beam on the substrate, and the depth of laser machining desired. The rotational speed of the substrate can be maintained constant during the process or it can be varied to further control the effect of the laser beam on the substrate. Drum 2 is preferably rotated at a speed of from about 50 rpm to about 5000 rpm, but more preferably from about 500 rpm to about 2000 rpm.

[0019] As drum 2 is rotated, a laser beam 10 from a conventional CO_2 laser (not shown) is directed at a predetermined surface portion of coating 6. Laser beam 10 is preferably provided by a continuous wave CO_2 laser. The inventors have found that CO_2 lasers provide a laser beam having a wavelength that is particularly well-absorbed by plastic binder resins commonly present in one or more layers of known photoreceptor coatings. A CO_2 laser emitting a beam at a wavelength of about 10.6 μm has been found to work well for organic coatings having polycarbonate binders. The laser beam can have a width equal to the predetermined surface portion to be treated, or it can be narrower. Carbon dioxide continuous wave lasers are commercially available and require no special modification to be effective in carrying out the invention. Alternatively, a pulsed beam CO_2 laser, yttrium aluminum garnet (YAG) laser, or excimer laser, among others, could be used to carry out the laser machining process.

[0020] The laser should have sufficient power to remove a desired amount of the particular coating treated. The power of the laser can be varied depending on the type of coating treated and the type of substrate. For example, to uniformly reduce the thickness of a polycarbonate coating on a photoreceptor substrate, a CO_2 laser having an output of about 800 watts has been found to provide preferred results. The watt density, focal length, focus, and angle of incidence of the laser also affect the machining process, and can be selected to achieve the intended results. A focal length of about 5 inches (127mm) and a surface focus or slightly off-surface focus are preferred. In the case of cylindrical coated substrates, the laser can be directed at the coating at an angle effective to remove the predetermined portion of coating 6. Laser beam 10 can intersect both coating 6 and substrate 4. However, in the case of a cylindrical coated substrate, laser beam 10 should not be directed along a diameter of the cylinder because this may cause the laser beam to reflect directly back into the laser, possibly damaging the laser.

[0021] At a given moment during laser treatment, laser beam 10 impinges on a spot 12 such that part of the

coating material in the area of spot 12 is rapidly heated and vaporized by laser beam 10. As drum 2 rotates during the laser machining process, a circumferential strip 14 of coating material 6 substantially the same width as the width of the laser beam is gradually removed. The laser is directed at the predetermined surface portion of coating 6 until the intended amount of coating has been removed.

[0022] In a preferred embodiment shown in FIG. 1, the width of laser beam 10 is less than the width of the circumferential strip 14 treated by the process. The laser source is mounted on a carriage (not shown) so as to be movable up and down in a direction parallel to axis 8. To uniformly remove part of the coating, drum 2 is rotated as laser beam 10 impinges on spot 12 near the upper edge of circumferential strip 14. The laser beam is then translated downward to cover the predetermined width of circumferential strip 14. Alternately, laser beam 10 can be translated in the opposite direction from the lower edge of circumferential strip 14 toward the upper edge of the circumferential strip. The translation speed of laser beam 10 can be from about 0.010 inch/second to about 0.10 inch/second (0.25 to 2.5mm/sec), preferably from about 0.030 inch/sec to about 0.80 inch/sec (0.76 to 2.03mm/sec), more preferably from about 0.040 inch/sec to 0.060 inch/sec (1.02 to 1.52mm/sec). Laser beam 10 can be translated across the predetermined surface portion of coating 6 more than once if needed.

[0023] Optionally, if laser beam 10 has a width less than the width of circumferential strip 14, laser beam 10 can be rapidly oscillated up and down to cover the desired width of coating 6 to be removed.

[0024] The predetermined surface portion of the substrate is purged with an inert gas such as nitrogen gas or helium gas as the laser beam is directed at the substrate. Purging can be carried out using a cross-jet and/or coaxial jet of inert gas directed at the surface of the substrate, or by other means. The coaxial gas pressure can be from about 30 psi to about 150 psi (207 to 1035 kPa) but preferably is from about 70 psi to about 100 psi (483 to 690 kPa). The cross-jet pressure can be from about 40 psi to 300 psi (276 to 2070 kPa) but preferably is from about 70 psi to about 120 psi (483 to 828 kPa). In the case of the cross-jet, the diameter of the orifice is important and should be from about 0.040 inches to about 0.150 inches (1.02 to 3.81mm), preferably from about 0.070 inches to about 0.120 inches (1.78 to 3.05mm).

[0025] When the desired amount of coating has been removed from the predetermined surface portion of coating 6, the laser and nitrogen gas are stopped and drum 2 is removed from the chucking device for further processing or use. A smoothly polished surface 16 is formed extending a predetermined depth into coating 6. The amount of coating removed can be precisely controlled to within a few μm using the process of the invention. The process allows the thickness of a coating to be uniformly reduced in a predetermined region of the coating. The resulting treated coating can have a uniform or variable thickness depending on the intended use of the product.

[0026] Preferred uses of the process include reducing the thickness of a seam of the coated photoreceptor, tapering or sealing an edge of the coated photoreceptor, or removing excess material in a sag area of a dip-coated photoreceptor drum by the action of the laser energy on the photoreceptor. These processes were previously carried out in the art by chemical or mechanical means, the need for which are eliminated by the present invention. For example, in the manufacture of certain photoreceptors, such as those including web coatings, the edges of the photoreceptor coating are slit using a rotary knife. This can cause the layers of the photoreceptor coating to begin to delaminate. Treating the edges with a laser beam according to the invention removes part of the coating and fuses the edges of the coating to seal the layers and prevent delamination.

[0027] In the case of a seamed belt photoreceptor, the seaming process causes the seam area to be thicker than the total thickness of the belt substrate and coating. Treating the seam to remove the thicker portion of the seam improves the motion quality and blade cleaning capability of the photoreceptor, and reduces the tendency of the seam to crack due to increased stresses.

[0028] The sag area on a dip coated photoreceptor is caused when a fluid coating runs or sags due to gravity during the coating process. This causes a greater coating thickness at one end of the photoreceptor. The excess coating thickness can be removed by laser machining the coating according to present invention thereby creating a higher quality photoreceptor.

[0029] FIG. 3 illustrates an exemplary use of the process of the invention to reduce the thickness of a seam or other area of non-uniform thickness in a photoreceptor coating. FIG. 3 shows a top view of a cylindrical photoreceptor drum 2 having a substrate 4 over which is formed a coating 6 of non-uniform thickness. As shown in the drawing, coating 6 has a region 18 of non-uniform thickness due to excess coating material. Photoreceptor drum 2 is shown in a mounted position just before being laser machined by laser beam 10 from laser nozzle 20. In this embodiment, laser beam 10 is positioned at an angle tangential to and just above the outer surface of coating 6.

[0030] FIG. 4 shows the results obtained when photoreceptor drum 2 of FIG. 3 is laser machined by the action of laser beam 10. Laser beam 10 contacts region 18 of coating 6 as region 18 is rotated through the area of traverse of laser beam 10. The area of contact between laser beam 10 and region 18 is purged with nitrogen gas (not shown) during the laser machining process. As illustrated in FIG. 4, the region 18 of excess coating material is ablated and removed by laser beam 10. As a result, the thickness of coating 6 is reduced in region 18 to form a coating 6 of uniform thickness. Although in FIGS. 3 and 4 laser beam 10 only contacts

region 18 of coating 6, laser beam 10 could be moved closer to substrate 4 if it is intended to uniformly reduce the thickness of the entire coating 6.

[0031] FIG. 5 shows a more preferred laser orientation. Laser nozzle 20 is perpendicular to the axis of drum 2 but off-set from the diameter of the drum. In this way, laser beam 10 intersects both coating 6 and substrate 4 without reflecting back into the laser. The action of the laser beam on the coating removes a precisely controllable portion of the coating. The depth of coating removed can be varied by altering the power level of the laser, its watt density and/or the traverse speed of the laser beam. Other factors such as the type of laser, the particular coating treated, and the substrate material and thickness, will affect the amount of coating removed by the process.

[0032] FIG. 6 shows a seamed photoreceptor belt being laser machined according to the invention. Seamed photoreceptor belt 22 includes a coating 6 having a seam 24 that extends a distance above the surface of the belt. FIG. 7 shows an enlarged partial cross-sectional view of coating 6 having a seam 24 extending a distance D above the coating. Laser nozzle 20 is oriented above seam 24 such that laser beam 10 impinges upon the seam. Laser beam 10 is traversed along seam 24 in the direction of the arrow to remove the excess seam material. Belt 22 is not rotated during this treatment process.

EXAMPLE

Laser Machining a Coated Photoreceptor

[0033] The invention will be illustrated with reference to a non-limiting example relating to the laser machining of a coated photoreceptor substrate.

[0034] A coated photoreceptor includes an aluminum substrate, a siloxane blocking layer approximately 0.5 µm thick, a charge generating layer consisting of anthanthrone pigment dispersed in a polymer film forming binder approximately 0.8 µm thick, and a charge transporting layer consisting of a diamine charge transporting compound dispersed in a polycarbonate film forming binder approximately 20 µm thick. The photoreceptor is mounted on a chucking device and rotated at 600 rpm. A CO_2 continuous wave laser having a power of 800 watts and a focal length of 5 inches (127mm) is impinged on a predetermined portion of the surface of the photoreceptor at a slightly off-focus setting. The laser nozzle is perpendicular to the axis of the drum but off-set from a line through the center by about 0.250 inches (6.35mm). The distance from the nozzle tip to the drum is approximately 0.200 inches (5.08mm). The laser beam is traversed across the surface of the photoreceptor at a speed of three (3) inches/minute (1.27mm/sec). During the laser machining process, the impinged area is purged with a coaxial jet of nitrogen gas at 80 psi (552 kPa) through a tapered copper nozzle and a cross jet of nitrogen through a straight nozzle having a 0.10 inch (2.54mm) orifice at a pressure of 90 psi (621 kPa) parallel to the axis of the drum.

[0035] The results of the process are shown in the profilometer trace of FIG. 2. The laser machining removes a precise amount of polymer coating from the predetermined surface portion of the photoreceptor. The residual surface 16 appears highly polished and uniform. Residual surface 16 is a distance D, in this example about 20µm, below an upper surface of the photoreceptor coating 6.

[0036] The process is repeated several times with similar results. Precise tolerances are achieved by the laser machining process of the invention. By modifying the power level of the laser, its watt density and/or its traverse speed, precise depth control can be achieved.

[0037] The invention enables the treatment of coated substrate surfaces to uniformly remove a portion of the coating in a predetermined region. The process results in a highly polished and uniform surface at tolerances of a few µm. The process obviates chemical or mechanical treatments conventionally used in the manufacture of coated photoreceptors.

Claims

1. A process for reducing the thickness of a polymeric photoconductive coating on a photoreceptor, characterized by

    directing a laser beam at a predetermined surface portion of said coating until an intended amount of the coating, which amount is less than the complete thickness of the coating, has been removed, thereby producing a coating of reduced thickness at the location of the predetermined surface portion, and

    purging said surface portion of the polymeric photoconductive coating with an inert gas directed upon the coating as the laser beam is directed at the coating.

2. The process of claim 1, wherein the coated substrate is rotated while the laser beam is directed at the substrate.

3. The process of claim 1 or 2, wherein the laser beam is moved across the predetermined surface portion of the polymeric photoconductive coating during the removal of the coating from the substrate.

4. The process of claim 1, 2 or 3, wherein the coating of reduced thickness has a uniform thickness.

5. The process of any of the preceding claims, wherein the photoreceptor is preferably a dip-coated pho-

toreceptor.

6. The process of any one of claims 1 to 5, wherein the laser beam is a beam from a carbon dioxide continuous wave laser moved across the photoreceptor to remove part of the coating from the predetermined surface portion of the polymeric photoconductive coatings.

7. The process of any of the preceding claims, wherein the predetermined surface portion of the photoreceptor is purged with nitrogen gas as the laser beam is directed upon the photoreceptor.

8. The process of any of the preceding claims, wherein the coating comprises at least one organic binder resin selected from the group consisting of polycarbonates, acrylate polymers, vinyl polymers, cellulose polymers, polysiloxanes, polyamides, polyurethanes, polyesters, and block, random or alternating copolymers thereof.

9. The process of any of the preceding claims, which comprises

   i) reducing the thickness of a seam of the coated photoreceptor by the action of the laser beam on the seam, and/or,

   ii) removing excess material in a sag area of a dip-coated photoreceptor drum by the action of the laser beam on the photoreceptor.

10. The process of any of the preceding claims, which comprises

   i) tapering an edge of the coated photoreceptor by the action of the laser beam on the photoreceptor, and/or

   ii) sealing an edge of the coated photoreceptor by the action of the laser beam on the photoreceptor.

11. The process according to claim 1, wherein the polymeric photoconductive coating comprises a polymer and a charge generating material and/or a charge transporting material.

12. The process according to claim 11, wherein the photoreceptor includes an aluminum substrate, a siloxane blocking layer, the charge generating layer comprises an anthanthrone pigment dispersed in a polymer film forming binder, and the charge transporting layer comprises a diamine charge transporting compound dispersed in a poycarbonate film forming binder.

Patentansprüche

1. Verfahren zum Verringern der Dicke einer polymeren fotoleitenden Beschichtung auf einem Fotorezeptor **gekennzeichnet durch**:

   Lenken eines Laserstrahls auf einen vorbestimmten Oberflächenbereich der Beschichtung bis eine gewünschte Menge der Beschichtung entfernt worden ist, wobei die Menge geringer als die vollständige Dicke der Beschichtung ist, um damit eine Beschichtung von verringerter Dicke an der Stelle des vorbestimmten Oberflächenbereichs zu erzeugen, und

   Spülen des Oberflächenbereichs der polymeren fotoleitenden Beschichtung mit einem inerten Gas, das auf die Beschichtung gerichtet wird, wenn der Laserstrahl auf die Beschichtung gelenkt wird.

2. Das Verfahren nach Anspruch 1, wobei das beschichtete Substrat gedreht wird, während der Laserstrahl auf das Substrat gelenkt wird.

3. Das Verfahren nach Anspruch 1 oder 2, wobei der Laserstrahl über den vorbestimmten Oberflächenbereich der polymeren fotoleitenden Beschichtung während der Entfernung der Beschichtung von dem Substrat bewegt wird.

4. Das Verfahren nach Anspruch 1, 2 oder 3, wobei die Beschichtung mit verringerter Dicke eine gleichförmige Dicke aufweist.

5. Das Verfahren nach einem der vorhergehenden Ansprüche, wobei der Fotorezeptor vorzugsweise ein tauchbeschichteter Fotorezeptor ist.

6. Das Verfahren nach einem der Ansprüche 1 bis 5, wobei der Laserstrahl ein Strahl aus einem Kohlendioxidlaser mit kontinuierlichem Ausgangsstrahl ist, der über den Fotorezeptor bewegt wird, um einen Teil der Beschichtung aus dem vorbestimmten Oberflächenbereich der polymeren fotoleitenden Beschichtungen zu entfernen.

7. Das Verfahren nach einem der vorhergehenden Ansprüche, wobei der vorbestimmte Oberflächenbereich des Fotorezeptors mit Stickstoffgas gespült wird, wenn der Laserstrahl auf den Fotorezeptor gelenkt wird.

8. Das Verfahren nach einem der vorhergehenden Ansprüche, wobei die Beschichtung zumindest eines der organischen Binderharze aus der Gruppe Polycarbonat, Acrylatpolymer, Vinylpolymer, Cellulosepolymer, Polysiloxan, Polyamid, Polyurethan, Poly-

ester, und Block-, zufällig oder alternierend angeordnete Copolymere davon, umfasst.

9. Das Verfahren nach einem der vorhergehenden Ansprüche, das umfasst:

   i) Verringern der Dicke einer Nahtstelle des beschichteten Fotorezeptors durch die Wirkung des Laserstrahls auf die Nahtstelle, und/oder,

   ii) Entfemen von Überschussmaterial in einem Abtropfbereich einer tauchbeschichteten Fotorezeptortrommel durch die Wirkung des Laserstrahls auf den Fotorezeptor.

10. Das Verfahren nach einem der vorhergehenden Ansprüche, das umfasst:

   i) Verjüngen eines Randes des beschichteten Fotorezeptors durch die Wirkung des Laserstrahls auf den Fotorezeptor, und/oder

   ii) Verschließen eines Randes des beschichteten Fotorezeptors durch die Wirkung des Laserstrahls auf den Fotorezeptor.

11. Das Verfahren nach Anspruch 1, wobei die polymere fotoleitende Beschichtung ein Polymer und ein ladungserzeugendes Material und/oder ein ladungstransportierendes Material umfasst.

12. Das Verfahren nach Anspruch 11, wobei der Fotorezeptor ein Aluminiumsubstrat und eine Siloxan-Blockierschicht, umfasst, und wobei die Ladungserhaltungsschicht ein Anthanthron-Pigment umfasst, das in einem einen Binder bildenden polymeren Film aufgelöst ist, und wobei die Ladungstransportschicht eine Diamin-Ladungstransportverbindung umfasst, die in einem einen Binder bildenden Polycarbonatfilm aufgelöst ist.

Revendications

1. Procédé destiné à réduire l'épaisseur d'un revêtement photoconducteur polymère sur un photorécepteur,
   caractérisé par

   l'orientation d'un faisceau laser vers une partie de surface prédéterminée dudit revêtement jusqu'à ce qu'une quantité prévue du revêtement, laquelle quantité est inférieure à l'épaisseur totale du revêtement, ait été enlevée, en produisant ainsi un revêtement d'épaisseur réduite au niveau de l'emplacement de la partie de surface prédéterminée, et
   la purge de ladite partie de surface du revêtement photoconducteur polymère à l'aide d'un gaz inerte dirigé sur le revêtement lorsque le faisceau laser est dirigé vers le revêtement.

2. Procédé selon la revendication 1, dans lequel le substrat revêtu est entraîné en rotation tandis que le faisceau laser est dirigé vers le substrat.

3. Procédé selon la revendication 1 ou 2, dans lequel le faisceau laser est déplacé en travers de la partie de surface prédéterminée du revêtement photoconducteur polymère durant l'enlèvement du revêtement depuis le substrat.

4. Procédé selon la revendication 1, 2 ou 3, dans lequel le revêtement d'épaisseur réduite présente une épaisseur uniforme.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel le photorécepteur est de préférence un photorécepteur revêtu au trempé.

6. Procédé selon l'une quelconque des revendications 1 à 5, dans lequel le faisceau laser est un faisceau provenant d'un laser à émission continue à dioxyde de carbone déplacé en travers du photorécepteur en vue d'enlever une partie du revêtement de la partie de surface prédéterminée des revêtements photoconducteurs polymères.

7. Procédé selon l'une quelconque des revendications précédentes, dans lequel la partie de surface prédéterminée du photorécepteur est purgée à l'aide d'un gaz azote lorsque le faisceau laser est dirigé sur le photorécepteur.

8. Procédé selon l'une quelconque des revendications précédentes, dans lequel le revêtement comprend au moins une résine de liant organique sélectionnée à partir du groupé constitué de polycarbonates, de polymères d'acrylates, de polymères vinyliques, de polymères de cellulose, de polysiloxanes, de polyamides, de polyuréthanes, de polyesters, et de copolymères séquencés, statistiques ou alternés de ceux-ci.

9. Procédé selon l'une quelconque des revendications précédentes, lequel comprend

   i) la réduction de l'épaisseur d'un raccord du photorécepteur revêtu grâce à l'action du faisceau laser sur le raccord, et/ou,
   ii) l'enlèvement de matériau en excès dans une zone de coulure d'un tambour de photorécepteur revêtu au trempé grâce à l'action du faisceau laser sur le photorécepteur.

10. Procédé selon l'une quelconque des revendications

précédentes, lequel comprend

i) l'amincissement d'un bord du photorécepteur revêtu grâce à l'action du faisceau laser sur le photorécepteur, et/ou
ii) le scellement d'un bord du photorécepteur revêtu grâce à l'action du faisceau laser sur le photorécepteur.

11. Procédé selon la revendication 1, dans lequel le revêtement photoconducteur polymère comprend un polymère et un matériau de génération de charges et/ou un matériau de transport de charges.

12. Procédé selon la revendication 11, dans lequel le photorécepteur comprend un substrat d'aluminium, une couche d'arrêt de siloxane, la couche de génération de charges comprend un pigment d'anthanthrone dispersé dans un liant formant un film de polymère, et la couche de transport de charges comprend un composé de transport de charges de diamine dispersé dans un liant formant un film de polycarbonate.

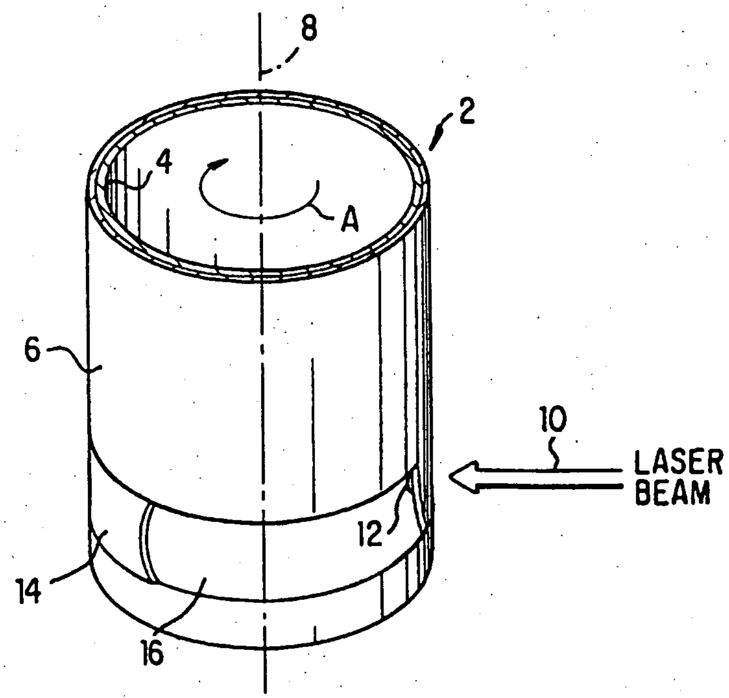

FIG.1

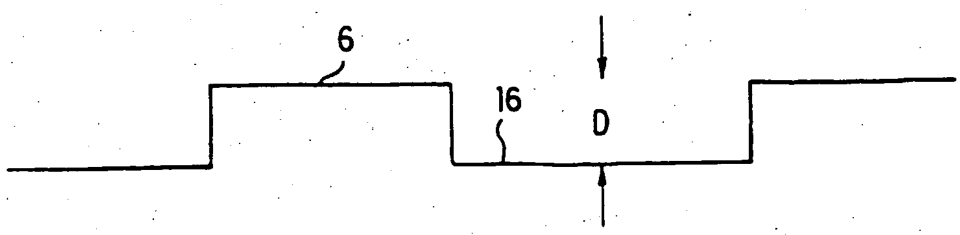

FIG. 2

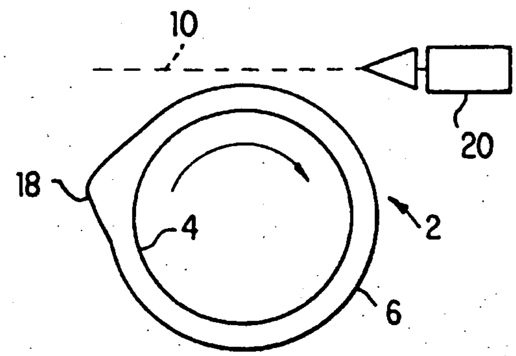

FIG. 3

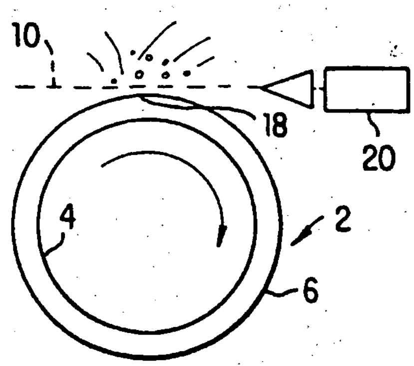

FIG. 4

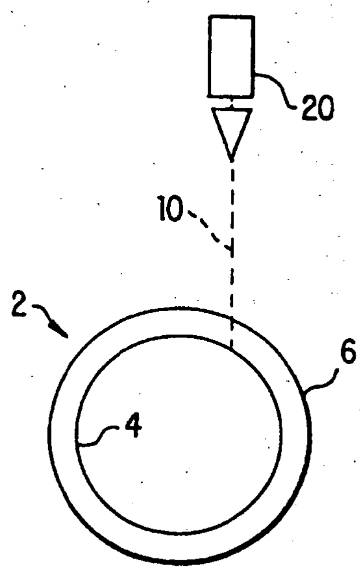

FIG. 5

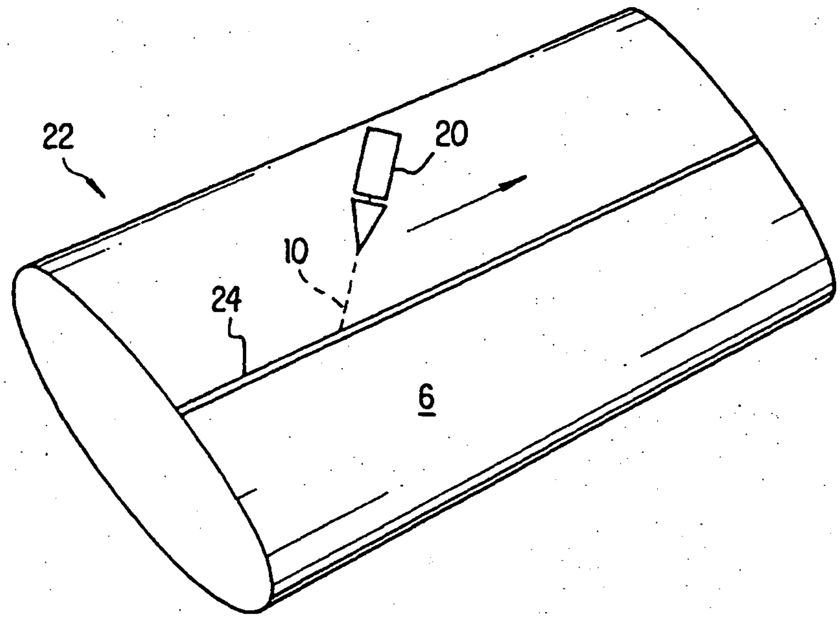

FIG. 6

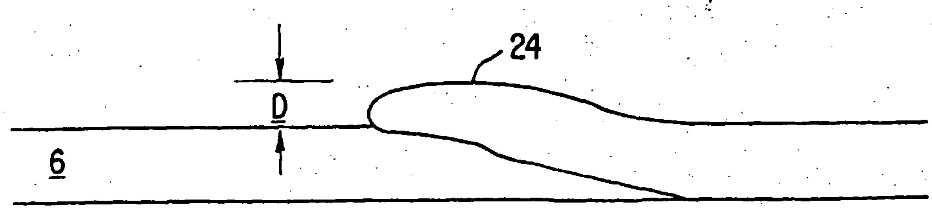

FIG. 7